

CLAMP DEVICE

Invented by

Daniel L. Poole

a resident of

3319 West Malapai Drive
Phoenix, Arizona 85051

and

Robert N. Poole

a resident of

39820 North Seventh Street
Phoenix, Arizona 85027

both citizens of
the United States

PHOENIX, ARIZONA

1 CLAMP DEVICE

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3 This application claims the benefit of U.S.
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6 FIELD OF THE INVENTION

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8 This invention relates generally to clamping devices,
9 and more particularly to clamping devices which can be
10 manipulated with one hand.

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12 BACKGROUND OF THE INVENTION

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14 Clamping devices are well known and have been in use
15 for many years. Particularly, straight bar friction
16 locking clamps are extremely popular. These clamp devices
17 can be operated one handed, and are very effective. The
18 problem with these devices is that they operate in a linear
19 fashion, with the clamping jaws sliding directly toward and
20 away from one another. This structure presents some
21 limitations such as limiting access of the clamp in tight
22 spots, etc.

1 Often, pliers are used to clamp items together because
 2 the motion of the handles permits their use in closer
 3 spaces. The problem with pliers is that the user must
 4 maintain the pressure on the handles, as they do not remain
 5 locked in position. Locking pliers using friction locks
 6 have been introduced, but while they will lock into a
 7 specific configuration, they will not clamp unless the
 8 material to be clamped is resilient. When rigid items are
 9 to be clamped, the clamping jaws will close to the surface
 10 of the item but will not hold it securely.

11

12 Accordingly, it would be highly desirable to provide
 13 an improved clamp device.

14

15 It is a purpose of the present invention to provide a
 16 clamp device which can be operated with one hand.

17

18 It is another purpose of the present invention to
 19 provide a clamp device which will securely hold a rigid
 20 item.

21

22 It is still another purpose of the present invention
 23 to provide a clamp device with a release trigger which
 24 remains in position.

1 It is a further purpose of the present invention to
2 provide a clamp device which can be operated in confined
3 spaces.

NO. 2, 057, 512

Summary of the Invention

The above problems and others are at least partially solved and the above purposes and others are realized in a clamp device. The clamp device includes a first member and a second member, each having a handle portion and a jaw portion. The jaw portions and/or the handle portions are flexible in an outward direction and biased in an inward direction for the jaw portion and the reverse for the handle portions. A pivot pivotally couples the first member and the second member intermediate their respective handle portion and jaw portion for opposed pivotal motion between an open position and a closed position. Also provided is a locking assembly having a frictionally engaged position, preventing the first member and the second member from moving toward the open position and a disengaged position allowing the first member and the second member to move toward the open position.

In specific embodiments the locking assembly includes an arcuate clamp bar having a first end coupled to the first member and a second end. An arc of the arcuate clamp bar is concentric with the pivot. Also provided is a ^{brake} lever having an end pivotally coupled to the second member

BRIEF DESCRIPTION OF THE DRAWINGS

Specific objects and advantages of the instant invention will become readily apparent to those skilled in the art from the following detailed description of a preferred embodiment thereof taken in conjunction with the drawings, in which:

FIG. 1 is a perspective view of a clamp device in accordance with the present invention, hidden portions illustrated in broken lines for clarity;

FIG. 2 is a plan view of a snap-on jaw portion broken away to illustrate pivotal movement;

FIG. 3 is a plan view of a clamp bar of the clamp device of FIG. 1;

FIG. 4 is a side elevational view of a brake lever of the clamp device of FIG. 1;

FIG. 5 is a plan view of the clamp device of FIG. 1 with the brake lever in an inoperative mode, portions thereof broken away;

1 FIG. 6 is a plan view of the clamp device of FIG. 1 as
2 it appears in the closed position, hidden portions
3 illustrated in broken lines for clarity;

4
5 FIG. 7 is a plan view of another embodiment of a clamp
6 device in the closed position according to the present
7 invention, hidden portions illustrated in broken lines for
8 clarity;

9
10 FIG. 8 is a plan view of a clamp bar of the clamp
11 device of FIG. 7;

12
13 FIG. 9 is a side elevational view of a brake lever of
14 the clamp device of FIG. 7;

15
16 FIG. 10 is a perspective view of the clamp device of
17 FIG. 7 as it appears in an open position, hidden portions
18 illustrated in broken lines for clarity;

19
20 FIG. 11 is a perspective view of another embodiment of
21 a clamp device according to the present invention;

1 FIG. 12 is a perspective view of yet another
2 embodiment of a clamp device according to the present
3 invention; and

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5 FIG. 13 is a plan view of a further embodiment of a
6 clamp device according to the present invention.

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1 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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4 Turning now to the drawings in which like reference
5 characters indicate corresponding elements throughout the
6 several views, attention is first directed to FIG. 1, which
7 illustrates a clamp device generally designated 20. Clamp
8 device 20 includes a pair of members 22 and 23 pivotally
9 connected by a pivot 24 (bolt, rivet, screw, etc.) for
10 pivotal opposed operation (i.e. scissors like motion).
11 Member 22 includes a handle portion 25 and a jaw portion 26
12 generally determined by pivot 24. Similarly, member 23
13 includes a handle portion 27 and a jaw portion 28 generally
14 determined by pivot 24. ^{B₁} The distal end of jaw portion 26
15 has a snap-on gripping member 30 pivotally coupled thereto
16 (see FIG. 2 for pivotal action). The distal end of jaw
17 portion 28 has a snap-on gripping member 31 pivotally
18 coupled thereto (illustrated in an unsnapped position for
19 clarity). Included in this embodiment is an optional
20 spring 35 which is carried by pivot 24 with outwardly
21 extending ends which engage handle portions 25 and 27 to
22 bias clamp device 20 into the open position illustrated in
23 FIG. 1. Spring 35 can be omitted allowing clamp device 20

1 to be operated similar to conventional pliers with manual
2 opening and closing.

3

4 In accordance with the present invention, clamp device
5 20 further has a locking assembly 40 including a clamp bar
6 42 and a brake lever 43. Clamp bar 42 is an elongate
7 arcuate design (see FIG. 3) with a coupled end 44 pivotally
8 attached to handle portion 25 by a roll pin 45 (or any
9 convenient mechanism to allow limited movement) permitting
10 relative pivotal movement. A free end 46 of clamp bar 42
11 extends unhindered through or adjacent to handle portion
12 27, allowing free relative movement of handle portions 25
13 and 27. It should be understood that clamp bar 42 can be
14 received in a groove or aperture 50 formed in handle
15 portion 27. It should also be understood that clamp bar 42
16 has an arcuate shape to correspond to the pivotal movement
17 of elements 22 and 23, and is positioned to be
18 substantially parallel to pivot 24, i.e. the arc of clamp
19 bar 42 is concentric with pivot 24. However, slight
20 variation will still operate.

21

22 Brake lever 43 has an aperture 52 formed therethrough
23 proximate a pivotal end 53. Clamp bar 42 is slideably
24 received through aperture 52 with pivotal end 53 of brake

1 lever 43 pivotally engaged in a notch 54 formed in handle
 2 portion 27 proximate pivot 24. A compression spring 55 is
 3 positioned between brake lever 43 and handle portion 27 so
 4 as to bias brake lever 43 outwardly away from handle
 5 portion 27 and frictionally engage clamp bar 42 at aperture
 6 52. Brake lever 43 is moveable between a frictionally
 7 engaged (locking) position and a disengaged position. In
 8 the frictionally engaged position brake lever 43
 9 frictionally engages clamp bar 42 preventing movement
 10 thereof and thereby preventing opening of clamp device 20
 11 without preventing the closing thereof, i.e. locking
 12 assembly 40 prevents clamp device 20 from opening but
 13 allows it to be closed or clamped to an object. Here it
 14 should be noted that spring 55 normally biases brake lever
 15 43 into the frictionally engaged (locked) position (as
 16 illustrated in FIG. 1). In the disengaged position brake
 17 lever 43 has been moved toward handle portion 27 against
 18 the bias of spring 55 removing the frictional engagement
 19 between brake lever 43 and clamp bar 42, permitting clamp
 20 bar 42 to move freely through aperture 52. Thus, clamp
 21 device 20 can be opened. A latch 60 is slideably mounted
 22 in handle portion 27 so as to be selectively engagable with
 23 a free end 61 of brake lever 43, holding brake lever 43 in
 24 the disengaged position (see FIG. 5) and able to operate as

1 conventional pliers. Turning to FIG. 6, clamp device 20 is
2 shown in a closed position. Because the curvature of clamp
3 bar 42 is concentric with pivot 24, break lever 43 does not
4 move longitudinally. This permits the use of latch 60 and
5 aperture 52 more closely sized to match the width of clamp
6 bar 42.

7

8 Referring now to FIGS. 7-10, another embodiment of
9 clamp device generally designated 120 is illustrated.
10 Clamp device 120 includes a pair of members 122 and 123
11 pivotally connected by a pivot 124 (bolt, rivet, screw,
12 etc) for pivotal opposed operation (i.e. scissors like
13 motion). Member 122 includes a handle portion 125 and a
14 jaw portion 126 generally determined by pivot 124.
15 Similarly, member 123 includes a handle portion 127 and a
16 jaw portion 128 generally determined by pivot 124. The
17 distal end of jaw portion 126 preferably has a snap-on
18 gripping member 130 pivotally coupled thereto although this
19 may be omitted. The distal end of jaw portion 128 has a
20 snap-on gripping member 131 pivotally coupled thereto
21 although this may be omitted if gripping member 130 is
22 omitted. Included in this embodiment is an optional spring
23 135 which is carried by pivot 124 with outwardly extending
24 ends which engage handle portions 125 and 127 to bias clamp

1 device 120 into the open position illustrated in FIG. 10.
 2 Spring 135 can be omitted allowing clamp device 120 to be
 3 operated similar to conventional pliers with manual opening
 4 and closing.

5

6 In accordance with the present invention, clamp device
 7 120 further has a locking assembly 140 including a clamp
 8 bar 142 and a brake lever 143. Clamp bar 142 is an
 9 elongate arcuate design (see FIG. 8) with a coupled end 144
 10 pivotally attached to handle portion 125 by a roll pin 145
 11 (or any convenient mechanism to allow limited movement)
 12 permitting relative pivotal movement to insure
 13 concentricity of the arc to pivot 124. A free end 146 of
 14 clamp bar 142 extends unhindered through or adjacent to
 15 handle portion 127, allowing free relative movement of
 16 handle portions 125 and 127. In this specific embodiment,
 17 handle portion 127 is hollow, and a pair of parallel spaced
 18 apart roll pin guides 156 contained therein receive clamp
 19 bar 142 slideably therebetween. In this fashion, instead
 20 of clamp bar 142 extending beyond the handle in the closed
 21 position it is contained within the hollow and thickened
 22 handle portion 127.

1 In each of the previously described embodiments, clamp
 2 devices 20 and 120 are preferably formed of a flexible
 3 material such as plastic. While rigid materials such as
 4 metal may be employed, the clamping operation will not be
 5 as effective unless the metal is flexible. By flexing in
 6 an outward direction under pressure from the item being
 7 clamped, the jaw portions of members 22 and 23 of device 20
 8 and members 122 and 123 of device 120 form a tension system
 9 which permits a tight clamping action by their bias in the
 10 inward direction. In the same manner, the handle portions
 11 of the members flex in an inward direction as compression
 12 is applied, and bias outwardly upon release of the
 13 compression force, placing pressure upon the jaw portions.

14

15 Turning now to FIG. 11, a further embodiment of a
 16 clamp device generally designated 220 is illustrated.
 17 Device 220 is substantially similar to devices 20 and 120,
 18 and in fact can be identical with the addition of clip
 19 springs 202 and 203 attached to members 222 and 223 at the
 20 distal ends of jaw portions 226 and 228 respectively.
 21 Thus, members 222 and 223 can be formed of a rigid material
 22 such as steel having no flex, with the flex provided by
 23 spring clips 202 and 203. In this manner a tension system
 24 providing a strong clamping action is achieved. However,

1 in this embodiment, clips 202,203 can be removed. Clamp
2 device 220 can be constructed of a resilient and flexible
3 material such as spring steel. In this manner, jaw
4 portions 226 and 228 can form a tension system as
5 previously described. Furthermore, members 222 and 223
6 include handle portions 225 and 227, respectively. Handle
7 portions 225 and 227 can also be formed of a flexible and
8 resilient material. To enhance the flexibility, the
9 handles can be hollowed as shown. This provides the
10 flexibility and shape memory required to form a tension
11 system as described previously.

13 Referring to FIG. 12, another embodiment of a clamping
14 device generally designated 320 is illustrated. Again,
15 device 320 is substantially identical to the previously
16 described embodiments, including a pair of members 322 and
17 323 pivotally connected by a pivot 324 (bolt, rivet, screw,
18 etc) for pivotal opposed operation (i.e. scissors like
19 motion). Member 322 includes a handle portion 325 and a
20 jaw portion 326 generally determined by pivot 324.
21 Similarly, member 323 includes a handle portion 327 and a
22 jaw portion 328 generally determined by pivot 324. A flex
23 in members 322 and 323 is provided by a pivot joint 302
24 formed in jaw portion 326. The slight pivot is biased by

1 compression spring 303 carried at pivot joint 302 to force
 2 the distal ends of jaw portions 326 and 328 toward one
 3 another in an inward direction. During a clamping
 4 operation, as jaw portions 326 and 328 are brought toward
 5 one another into contact with an item to be clamped, the
 6 terminal ends are moved outward against the bias of spring
 7 303 bringing the whole structure under tension and forming
 8 a strong clamping action. It should be understood that a
 9 pivot joint and compression spring can also be installed on
 10 jaw portion 328.

11
 12 With reference to FIG. 13, another embodiment of a
 13 clamp device generally designated 420 is illustrated.
 14 Clamp device 420 is substantially identical to the previous
 15 embodiments, including a pair of members 422 and 423
 16 pivotally connected by a pivot 424 (bolt, rivet, screw,
 17 etc.) for pivotal opposed operation (i.e. scissors like
 18 motion). Member 422 includes a handle portion 425 and a
 19 jaw portion 426 generally determined by pivot 424.
 20 Similarly, member 423 includes a handle portion 427 and a
 21 jaw portion 428 generally determined by pivot 424. Clamp
 22 device 420 further has a locking assembly 440 including a
 23 clamp bar 442 and a brake lever 443. The difference
 24 between this embodiment and previous embodiments, is that

1 jaw portions 426 and 428 are coupled to handle portions 425
2 and 427 at substantially right angles thereto. Thus the
3 jaws portions extend substantially perpendicularly from
4 pivot 424 with respect to the handle portions. Any of the
5 variously disclosed tension systems may be employed in
6 clamp device 420.

7

8 Various changes and modifications to the embodiments
9 herein chosen for purposes of illustration will readily
10 occur to those skilled in the art. For example, while the
11 arcuate clamp bars are illustrated coupled at one end by a
12 pin, it will be understood that the clamp bars may be
13 coupled by being integrally formed with one of the handle
14 portions, adhered thereto or welded, etc. To the extent
15 that such modifications and variations do not depart from
16 the spirit of the invention, they are intended to be
17 included within the scope thereof which is assessed only by
18 a fair interpretation of the claims.

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20 Having fully described the invention in such clear and
21 concise terms as to enable those skilled in the art to
22 understand and practice the same, the invention claimed is: